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FARICH with dual aerogel radiator

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The Super c-Tau Factory is the project of future electron-positron colliding beam experiment with unprecedented high luminosity $10^{35} cm^{-2} s^{-1}$ in the interaction energy range from 3 to 7 GeV, where the most part of charmonium states are produced and the tau-lepton production threshold is located as well. To provide a such high luminosity the Crab-Waist (CW) scheme of beam interaction was suggested. The main goals of the project are to make precise tests of the standard model (SM) and search for the phenomena beyond the SM with statistic exceeded in few orders of magnitude all data accumulated in previous experiments in this energy range. To perform a broad Physics program of the project the high performance universal detector is needed. The current status of R&D on particle identification system for the SCTF project based on Focusing Aerogel RICH (FARICH) is presented as well as a brief description of the SCTF project status. The FARICH is a very powerful particle identification technique. The FARICH detector based on 4-layer focusing aerogel monolithic radiator with total thickness 36 mm and maximal refractive index n=1.05 is able to provide excellent π/K-separation up to momentum P=6 GeV/c and mu/pi-separation up to P=1.5 GeV/c. The main disadvantage of the FARICH technique is the relatively high threshold momentum for mu/pi-separation (about P=0.4 GeV/c). For μ/π separation below 0.2 GeV/c it is necessary to use energy loss deposition technique in the track system because particles with such momentum will not reach the dedicated PID system due to magnetic field of detector (about 1.5 T). To provide μ/π-separation in the gap between 0.2 and 0.4 GeV/c the FARICH detector with dual aerogel radiator was suggested. The capability of particle separation for dual radiator RICH based on 4-layer focusing aerogel with maximal n=1.05 tile combined with aerogel tile with n=1.1 was studied with help of GEANT4 simulation. New production technology of high transparent aerogels with high optical densities based on small dope of zirconium dioxide to SiO_2 aerogels was suggested. Parameters of first ZrO_2-SiO_2 aerogels were measured and presented. It is shown that such approach allow us to produce aerogel with n=1.12 and light scattering length at 400 nm above than 30 mm. First beam tests results of FARICH based on dual radiator combined of 4-layer focusing tile and tile with n=1.1 are presented.

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